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EROSION CONTROL PRACTICES DIVISION

First and Second Year Yields of Corn Following one and two Years of Meadow - F. W. Schaller, Ames, Iowa.-"The average yields of first-and second-year corn from the rotation study on Marshall silt loam at Clarinda have been summarized and are presented in the following table. First-year corn, when averaged for the three rotations, has produced 12.3 bushels per acre more than second-year corn over the per od 1943-50. It is interesting to note that second-year corn following one year of meadow was 15.5 bushels per acre less than first-year corn, whereas following two years of meadow the yield was 9.6 bushels per acre less. Furthermore, this difference appe ars to be widening with years. In 1950 second-year corn after one year of meadow was 23.1 bushels per acre less than first-year corn, but only 2.3 bushels per acre less when it followed two years of meadow.

Yields of first- and second-year corn following meadow or sweet clover catch crop, Experiment IX, Marshall silt loam, 1943-50

Crop rotation	Yield (Bu/A)			
	First-Year corn		Second-year corn	
	1950	1943-50	1950	1943-50
C-C-O swcl	94.5	79.6	70.5	67.9
C-C-O-M	122.7	88.6	99.6	73.1
C-C-O-M-M	126.6	89.2	124.3	79.6
Average	114.6	85.8	98.1	73.5

Bu/A increase first-year corn over second-year corn

Crop rotation	1950	1943-50
C-C-O swcl	24.0	11.7
C-C-O-M	23.1	15.5
C-C-O-M-M	2.3	9.6
Average	16.5	12.3

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** All research work of the Soil Conservation Service is in cooperation ith the various State Experiment Stations.

Soil and Water Loss from Corn, Oats and Grain in Rotation - O. E. Hays, LaCrosse, Wisconsin.-"In only one year during the past ten years at LaCrosse has soil loss from corn exceeded that from grain. The plots are in a five-year rotation of CGHHH. The average annual soil loss for the period was 7.7 and 16.4 tons per acre, respectively, for corn and grain. In other words, grain lost 2.1 times as much as corn. The comparative loss for a CGH rotation was 8 and 21.9 tons per acre, respectively, for corn and grain for the 4-year period, 1947-1950. The loss from grain was 2.7 times that from corn. For the same four year period, the loss was 6.1 and 18.7 tons per acre, respectively, for corn and grain in the CGHHH rotation, or 3.1 times as much from grain. One year of cultivated crop so greatly reduces the soil's resistance to erosion, as influenced by structure and organic matter, that losses are excessive the second year regardless of whether there is one or three years of hay in the rotation.

"Seeding grains or legumes in the fall would be expected to reduce the loss from grain. Three years of records are available and are summarized in the following table. The plots were in a CGH rotation.

Season	WINTER GRAIN		SPRING GRAIN	
	Runoff Inches	Soil loss T/A	Runoff Inches	Soil loss T/A
Sept. 1 to April 1	5.3	13.3	3.1	11.3
April 1 to July 1	0.9	0.8	1.8	17.9
Sept. 1 to July 1	6.2	14.1	4.9	29.2

"On the winter grain plots, the soil between the rows of standing corn was tilled sufficiently to prepare a suitable seedbed for seeding on about the first of September. The spring grain plots were plowed about the first of October. Early fall rains caused more soil loss from the loose seedbed on the winter grain plots until the grain was up 5 or 6 inches high. After plowing, the spring grain plots yielded very little runoff in the fall while the surface was unfrozen. For the period shown, September 1 (time of seedbed preparation) to April 1 (time of last thaw), the winter grain allowed about 2 inches more runoff and 2 tons more soil loss than the spring grain plots. That is, if the winter grain was to be killed by spring tillage and seeded to spring grain, the only advantage would be the influence of the mulch and the organic matter incorporated into the soil on soil losses from rains following tillage.

"During the period of high losses from spring grain (April 1 to July 1), the spring grain plots lost one inch more runoff and 17 tons more soil. The winter grain plots were not tilled in the spring. For the total of the two periods, winter grain lost one inch more runoff but spring grain lost about two times as much soil.

"Fall grain can be used in parts of Wisconsin where alfalfa can be successfully seeded on frozen soil and where red clover is used in the rotation. One could expect a 50 percent reduction in soil losses from the grain year. However, at LaCrosse it has not been found possible to successfully seed alfalfa in the summer in standing corn, on frozen soil, or in winter grain unless the soil is tilled enough to practically kill the grain."

Practical Methods of Modifying the Structural Properties of New Jersey Soils in Relation to Conservation - O. R. Neal, New Brunswick, N. J. - "Effective conservation measures for cultivated land ordinarily require a combination of necessary mechanical practices with good soil management practices. This study concerns systems of soil management which influence soil structural conditions and hence influence soil and water conservation. The rotation of cultivated crops with sod or other non-cultivated crops at regular (3 or 4 yr.) intervals reduces runoff and erosion losses and increases acre yields. During 1950 soil losses from tomatoes and sweet corn on rotated land were reduced 65% and water losses reduced 75% as compared with continuously cultivated land. Acre yields were increased 24% for tomatoes and 39% for sweet corn on the better managed land. The degree of aggregation of silt and clay particles was consistently greater on the rotated areas.

"Soil physical properties were directly correlated with crop yields at numerous locations of land resting trials in the field. Each location provided a continuously cultivated area and an adjoining area that was out of cultivation during the previous year. In general, the resting treatments decreased volume weight and increased soil porosity and degree of aggregation of fine particles. Yields of cultivated crops varied inversely with changes in volume weight and directly with changes in porosity and aggregation."

Runoff and Erosion from Permanent Pastures - O. W. Beale, Clemson, S. C.-"Installation of runoff plots in four permanent pastures was completed in February. The rainfall for March was slightly above the average and runoff occurred from three pastures. The following table shows the percent runoff, rainfall and slope for the various pastures being studied. Pasture No. 1, Ky. 31 Fescue-Ladino clover, is dominantly fescue and the highest runoff, 9.03%, occurred from it. This pasture has not been grazed this year, although the growth is excellent. Pasture no. 2 has more fescue than bur clover at present and the growth is good. Grazing started about March 1. Pasture No. 3, Alta Fescue-Ladino clover, has considerably more Ladino clover than fescue, and the clover growth is superior. It has not been grazed and there was no runoff, although the slope is greatest on this pasture. Pasture No. 4 is mostly fescue with some crimson clover and bur clover. Grazing was started in the latter part of March. Runoff from pasture No. 4 was less than 0.1". There was no soil loss from any of the pastures.

Runoff from permanent pastures during March

	Pasture	Slope	Rainfall	Runoff
		%	Inches	%
1	Ky. 31 Fescue-Ladino clover	8.6	6.07	9.03
2	Bur clover-Sericea lesp.-Fescue	7.9	5.97	0.67
3	Alta Fescue-Ladino clover	14.0	6.09	none
4	Fescue-Bermuda grass-mixed clovers	13.5	6.06	0.12

Stubble Mulch Tillage and Planting Experiments with Corn - T. W. Edminster, Blacksburg, Va.-"The following is a summary of the 1950 stubble mulch tillage planting experiment which consited of a randomized split black design with four replicates of each treatment. Mulch tillage treatment T2 which consists of the double-cut plow, one spring tooth harrowing and one discing was selected for the planting experiment on the basis of its desirable physical manipulation of the soil.

"The planting treatments, P1, P2, P3, P4, P5 and P6, were designed to test various standard planter modifications which could be made with attachments commercially available. (See table 1).

"Yield and stand data were analyzed by the analysis of variance. None of the differences recorded proved significant at the 0.05 level. There are, however, rather definite indications that the planting treatments which included disc hillers adjusted to remove the mulch materials from the corn row area resulted in higher stands. This is in agreement with previous results.

"Periodic stand counts were made throughout the season for the purpose of measuring stand damage to cultivation and other causes. These results show that 4.02 percent of the stalks on the mulch plots and 2.02 percent on the checks were damaged by cultivation.

"In order to determine the effectiveness of the double-cut plow method of mulch tillage in the Piedmont area, a simple pilot trial was conducted on the Harrison farm near Appomattox, Virginia, in 1950. Results of these trials are summarized in Table 2. The comparisons consisted of early and late tillage with the double-cut plow compared with early and late use of the turn plow. The spring tooth harrow was used to perpare the seedbed on all areas. A standard horse-drawn two-row corn planter equipped with runner openers was used. Fertilization consisted of 700 lbs./acre 2-12-12 broadcast and 300 lbs./acre 2-12-12 in the row.

"The mulch treatment gave the lower yields from both dates of tillage but gave the highest stand where the double-cut plow was used early.

"All phases of the mulch tillage development work progressed satisfactorily during the year. The fact that the differences in yields and stands are not significant by analysis indicates that the mulching practices used are undoubtedly sound basically. Further refinements are desirable, particularly in the preparation of the seedbed following the basic tillage with the double-cut plow. Fertilizer placement, planting, and cultivating practices must be investigated further. All of these factors will be studied in detail next year. The work will be expanded to other sections of the state as rapidly as resources permit.

Table 1.--Mulch tillage - planting experiment - 1950 Kipps farm

No. Samples	Treatments*	Yield (Bu/Ac)	Stand (Stalks/Ac)	No. Ears Per Acre	Ear Size Factor
72	T1	70.5	14,437	14,570	.00484
72	T2	66.8	13,103	13,792	.00484
24	P1	62.7	12,259	13,302	.00472
24	P2	68.4	13,378	13,700	.00499
24	P3	70.0	15,370	14,972	.00468
24	P4	72.1	14,080	14,459	.00499
24	P5	74.1	14,953	15,009	.00494
24	P6	64.6	12,600	13,662	.00473
12	P1 x T1	68.9	13,472	14,307	.00482
12	P2 x T1	69.3	14,459	14,194	.00488
12	P3 x T1	73.8	17.078	16,167	.00457
12	P4 x T1	74.8	14,953	15,256	.00490
12	P5 x T1	75.4	14,573	14,839	.00508
12	P6 x T1	61.1	12,106	12,676	.00482
12	P1 x T2	56.6	11,044	12,296	.00460
12	P2 x T2	67.5	12,296	13,207	.00511
12	P3 x T2	66.3	13,662	13,776	.00481
12	P4 x T2	69.6	13,207	13,662	.00509
12	P5 x T2	72.0	15,332	15,180	.00474
12	P6 x T2	68.1	13,093	14,649	.00465

Tillage Treatments:

T1 - Seedbed prepared by the conventional turn plow method.
T2 - Crop residue mulch seedbed prepared by the "double- ut

Planting Treatments

P1 - Standard planter with runner opener and fertilization F1.
P2 - Standard planter with runner opener and fertilization F2.
P3 - Standard planter with double-disc opener, fertilization F2 and disc hiller attachment.
P4 - Standard planter with double-disc opener and fertilization F2
P5 - Standard planter with runner opener, fertilization F2 and disc hiller attachment.
P6 - Standard planter with double-disc opener, compaction weight attached and fertilization F2.

Fertilization Methods

F1 - 300 lbs/acre of 4-12-4 broadcast at seeding time.
200 lbs/acre of 4-12-4 in band 2" to side and at same depth of seed.
F2 - 500 lbs/acre of 4-12-4 in band 2" to side and 2" below seed.

Table 2.--Results of Exploratory Mulch Tillage Trials on Harrison Farm near Appomattox, Virginia, in 1950

No. Samples	Tillage Treatments*	Yield (Bu./Ac)	Stand (Stalks/Ac.)	No. Ears per acre	Ear Size Factor
4	Double-cut plow in January	93.2	10,581	11,411	.00817
4	Turn plow in January	102.5	9,647	11,100	.00923
4	Double-cut plow in March	87.4	9,440	10,685	.00818
4	Turn plow in March	100.1	10,477	10,477	.00955

* All areas were spring-tooth harrowed on April 15 and again on May 5. The corn (US-99) was planted on May 6. All plots were spike-tooth harrowed on May 23.

Method for Determining Field Capacity of Soil - Joel E. Fletcher, Tucson, Arizona.-"The need for a rapid field method for determining field capacity of soils has been met by the portable pressure chamber. The chamber with its accessories weighs about 4 pounds and costs about $6.00 to construct.

"On medium and fine textured soils its values check closely with the moisture equivalent, while on sands they check the field capacity better than the moisture equivalent does. Typical results are tabulated below.

Sample	Moisture Equivalent	Field Capacity
1	7.3	13.4*
2	23.8	23.9
3	20.2	22.2
4	16.1	17.2
5	19.5	19.9
6	22.4	20.0
7	25.3	27.8

* Field capacity by sampling - 14.0

"It appears that this chamber will prove as good as the usual laboratory methods for determining field capacity of soils and have the additional advantage of being sufficiently portable to be used by survey men in the field."

Tillage Practice and Straw Application in Relation to Soil and Water Loss on Fallowed Wheat Land - Glenn M. Horner, Pullman, Washington, "With the close of the winter runoff season, the data from the control plots show that erosion losses from the various cover conditions during the 1950-51 winter season were approximately one-tenth as great as the average for the last ten years.

"Soil and water losses from the stubble utilization plots are summarized in the following table. The cropping system on these plots is winter wheat alternating with summer fallow with wheat straw left on the surface with sweep tillage and turned under with moldboard plowing.

"The moldboard plowed plots with no straw returned had runoff losses during five periods, while the subsurface tilled plots with the one-ton and two-ton straw applications permitted runoff from only one storm. This storm occurred while the soil was frozen. The other treatments had erosion losses during two or three storms. Clean tillage and straw removal for the last ten years has resulted in a definite deterioration in soil structural relationships.

Initial tillage for summer fallow	Straw returned to soil	Erosion losses, 1950-51	
		Water	Soil
	(T/A)	(Inches)	(T/A)
Subsurface (sweep)	2	0.22	0.2
Subsurface (sweep)	1	0.29	0.3
Subsurface (sweep)	0	0.29	0.6
Moldboard plow	2	0.15	0.5
Moldboard plow	1	0.31	1.3
Moldboard plow	0	1.24	4.5

Cover and Tillage Management of Experimental Peach Orchard - John T. Bregger, Clemson, S. C.-"Tree measurements were made on all plots. In a group of 45 separate treatments, the accumulative effects on tree growth are expressed in terms of trunk circumference in the following tables:

Table 1.-- Experimental Orchard No. 1 - Planted in 1939

Treatment	Trunk Circumference (Ins.)
Continuous cultivation (check)	25.25
Grain straw mulch	28.2
Sorghum pomace mulch	24.9
Lespedeza sericea; unmowed	24.35
Lespedeza sericea; mowed	21.25
Kobe lespedeza; unmowed	21.55
Kobe lespedeza; mowed	23.75
Soybeans-Sudan grass; unmowed	22.95
Soybeans-Sudan grass; mowed	23.8
Crimson clover; no cultivation	26.05
Vetch, spring cultivation	28.05
Rye, spring cultivation	24.0
Crabgrass, following vetch	28.0
Soybeans, following vetch	28.1
Soybeans, following rye	23.9
Crabgrass, following rye	24.1
Vetch winter c.c.; minimum tillage	27.3
Vetch winter c.c.; 1-1/2 months tillage	28.7
Vetch winter c.c.; 3 months	28.6
Rye winter c.c.; minimum tillage	23.6
Rye winter c.c.; 1-1/2 months	23.6
Rye winter c.c.; 3 months	22.9
Vetch winter c.c.; minimum tillage	27.85
Vetch winter c.c.; 1-1/2 months weed control	28.6
Vetch winter c.c.; 3 months weed control	27.6
Rye winter c.c.; minimum tillage	25.3
Rye winter c.c.; 1-1/2 months weed control	25.55
Rye winter c.c.; 3 months weed control	23.3
Vetch residues left on surface	28.1
Vetch residues incorporated	28.05
Rye residues left on surface	24.7
Rye residues incorporated	23.35
Soybean residues left on surface	25.85
Soybean residues incorporated	25.85
Crabgrass residues left on surface	26.6
Crabgrass residues incorporated	25.55

Table 2. Experimental Orchard No. 2 - Planted in 1941

Treatment	Trunk Circumference
	Inches
Continuous cultivation (check)	20.7
Crotalaria spectabilis, spring cultivation	21.7
Vetch, spring cultivation	22.3
Bur clover, summer cultivation	22.3
Bur clover, no cultivation	21.0
Soybeans-Sudan grass, spring cultivation	21.25
Rye residues left on surface	21.1
Rye residues incorporated	18.45
Korean lespedeza, continuous cover	20.25
Korean lespedeza, spring tillage	20.7
Korean lespedeza with rye as winter c.c.	20.2

"Most significant differences are shown by (1) straw mulch over sorghum pomace as a mulch; (2) crimson clover with no cultivation over continuous clean cultivation; (3) vetch over rye as a winter cover crop; (4) 1-1/2 months of spring tillage over minimum tillage; (5) cover crop residues left as mulch on soil surface over incorporation of cover crop residues; (6) Crotalaria spectabilis and Sudan grass with soybeans with minimum spring cultivation over continuous cultivation; (7) Korean lespedeza with spring cultivation over Korean lespedeza with no cultivation and (8) bur clover with summer tillage over bur clover without cultivation. No differences are shown between: (1) soybeans and crabgrass as a summer cover crop; (2) Korean lespedeza continuous cover and in sequence with rye. Mowing of perennial cover crop (lespedeza sericea) showed no benefits whereas mowing of two summer annuals (Kobe lespedeza and Soybeans-Sudan grass) did appear advantageous

"The most striking differences between cover crop stands in the Experimental Orchard this spring have to do with the presence and absence of surface trash. On bare ground practically all new seedings were spotty or entirely missing due to winter heaving. On areas where cover crop or weed residues were present, stands were reasonably good. On areas where little or no cultivation had taken place in 1950 and surface trash was complete, almost perfect stands had resulted. In the case of crimson clover in its tenth year of voluntary reseeding, the stand was best of all."

Measurement of Soil Splash from Four Soils - C. A. Van Doren, Urbana, Illinois.-"Samples of sand and samples of four soils were exposed to natural rains for measurement of soil splash from May 3 through November 9, 1950. Samples of the following soils were exposed: Flanagan silt loam (Urbana), Onarga fine sandy loam (Kankakee), Grantsburg silt loam (Dixon Springs) and Elliott silt loam (Joliet).

"The relative susceptibility of the soil to splashing by rain drops is expressed as a ratio to the amount of sand splashed. This ratio is obtained by dividing the grams of soil splashed from the exposed cups of soil by the grams of sand splashed.

"The four soils ranked in the following order in increasing resistance to rain drop action: Onarga fine sandy loam, Flanagan silt loam, Elliott silt loam and Grantsburg silt loam. The grams of soil splashed and the relative resistance of the soil particles are shown in the following table:

Grams of Soil Splashed and Relative Resistance, 1950

	Grams	Ratio
Sand	475.9	
Flanagan silt loam	148.1	0.31
Onarga fine sandy loam	237.2	0.53
Grantsburg silt loam	82.2	0.18
Elliott silt loam	126.3	0.28

Yields and Nitrogen Content of Four Annual Legumes - F. L. Duley, Lincoln, Nebraska.-"Jack Baird, a graduate student and assistant in Soil Conservation-Research has compiled data showing nitrogen content of several annual legumes with which we have been working. The data in table 1 shows yields and analyses of the highest yielding plots of each legume.

Table 1.--Yields and nitrogen content of four annual legumes.

Plant	Part of Plant	Air-dry wt. Lbs. per A.	% N. oven-dry wt.	Lbs. N. Per A.
Partridge peas	Tops	4375	1.60	63.6
" "	Seed	816	5.62	41.7
" "	Roots (a)	112	.55	.6
Hubam S. Clover	Tops	4414	2.42	97.1
" "	Roots	396	.77	2.8
Lespedeza	Tops	6193	2.25	126.6
"	Roots	708	1.10	.7
Vetch	Tops	5182	2.62	123.4
"	Roots	158	1.25	1.8

(a) The roots were obtained by pulling the plants and therefore did not represent the entire root system.

"Miss Helen Budeit, graduate student has been determining the number of denitrifying organisms found in soils under different treatments. Although the methods for making these readings are not as satisfactory as would be desired, the results should indicate in a general way the prevalence of these organisms. Table 2 will show a few of the results obtained to date. Although there was a wide variation in the readings there was at least a general tendency for very heavy applications of straw which kept the soil moist more of the time to show higher numbers of these denitrifying organisms.

Table 2.--Numbers of denitrifying organisms as affected by different amounts of straw mulching. (Numbers in millions per gram of soil).

Depth of sample - Inches	Tons of straw per acre			
	0	2	4	8
			May 31, 1950	
0-1	0.08	0.23	7.99	3.32
1-6	0.55	0.31	3.66	10.21
			July 24, 1950	
0-1	0.17	1.01	5.52	27.74
1-6	1.33	1.00	3.00	4.54
			October 6, 1950	
0-1	10.92	110.40	662.71	530.58
1-6	15.68	41.79	109.45	1080.33

"Other determinations show that where stubble was plowed under the number of denitrifying organisms was lower in the surface inch than where the residue was left on top of the soil. In the 1-6 inch depth they were higher on the plowed land. This indicates that in each case the greatest number of these organisms were where the concentration of organic matter was highest. So far there has not been a very close negetive correlation between the number of denitrifying organisms and the amount of nitrate nitrogen in the soil."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Precipitation for the month totaled 4.39 inches which was about 0.8 inch in excess of normal. On 19 of the 31 days there was at least a trace of precipitation. The rainfall intensities were low and there was no large amount of rain in any single storm. Consequently, the surface runoff was not great from any of the small watersheds. Soil moisture was well above field capacity, percolation was continuous, and spring and seepage flow quite high.

"Frost penetration in unmulched wheat areas for the month reached 1-1/2 inches whereas, in the areas mulched with manure and corn stover, the frost penetrated only 1/2 inch.

"Plant nutrient losses in percolation water from Keene silt loam lysimeters for the year 1950 showed greater calcium, magnesium, and nitrate losses under conservation practices (plus greater application of chemical fertilizers) than from poor land-use practices. Potash losses in leachate were less on the conservation practices. Nitrate losses appear to be variable."

Table 1.--Some plant nutrient losses in lysimeter percolates under both conservation and poor practices, Keene silt loam. Data are for year 1950 and the 8-year averages. Expressed in pounds per acre per year.

Land-use practices	Calcium	Magnesium	Potassium	Nitrate nitrogen	Percolation (inches)
1950 - Conservation Y103 A & B	51.79	30.18	12.55	5.62	12.61
Poor practices Y103 C & D	30.81	18.69	20.56	2.86	13.40
8-year average					
Conserv. prac.	35.04	18.87	12.03	3.80	-
Poor prac.	29.13	16.36	18.78	4.36	-

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"At the Project Headquarters rainfall for the month of March totaled 1.76 inches compared to a normal of 3.09 inches at Waco. While the rains of this month have added to soil-moisture supplies, there has been no appreciable amount of runoff since February 1950. Deep soil moisture is practically non-existent, and ground-water supplies are very low. Many stock tanks in the area are dry, and the supply of water for domestic use and livestock is becoming critically short.

"The moisture conditions at the end of March show a favorable increase over February conditions. Samples taken in the Y and W areas on March 29 gave the following percentages of moisture at the indicated depth intervals:

"Y Area: 0-6 inches, 32.2 percent; 6-12 inches, 30.7 percent; 12-24 inches, 27.7 percent; 24-36 inches, 26.9 percent; 36-48 inches, 27.3 percent; 48-60 inches, 27.8 percent.

"W Area: 0-6 inches, 30.7 percent; 6-12 inches, 30.9 percent; 12-24 inches, 30.0 percent; 24-36 inches, 29.0 percent; 36-48 inches, 27.8 percent; 48-60 inches, 27.8 percent.

"The cultivated field with the lowest percentage of moisture below 24 inches is a field on which a crop of Madrid Sweet Clover was grown in 1949-50 and turned under as a green manure crop in August. The top 24 inches of soil has apparently been able to absorb all the rainfall since the clover was turned under. The percentages of moisture at the different depth intervals on April 3 were as follows: 0-6 inches, 29.0 percent; 6-12 inches, 29.8 percent; 12-24 inches, 26.6 percent; 24-36 inches, 20.1 percent, 36-48 inches, 18.9 percent; and 48-60 inches, 19.2 percent.

"The 2-year old seeding of K. R. Bluestem withstood the exceptionally dry fall and cold winter, whereas a high percentage of a first year seeding was killed. Upland Bermuda grass pastures were severely damaged. The KY 31 Fescue seeded in 1948 had about 25 percent of the old plants killed. Black Medic and Crimson Clover seeded at the same time as the Fescue passed out after the second year of reseeding. Bur clover and Singletary Peas were able to stand the adverse conditions and are up to a good stand for the third season."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"Rains which fell during the last part of March delayed farming operations. Normally the oats are planted as soon as weather conditions permit in the spring of the year, however, this year it may be a little later than usual. During March 1.34 inches of precipitation fell as compared to the long period average of 1.04 inches.

"A survey of the number of livestock and the various farm machinery, and average age, on 19 farms in the project area was made. This survey was previously made in 1939, and the following tables show the changes in the past 12 years:

Table 1.--Average number and kind of livestock per farm on 19 farms in Central Great Plains Experimental Watershed, Hastings, Nebr., 1939 and 1951

	1939	1951
Horses	5.0	2.3
Beef cattle	13.7	17.0
Dairy cattle	.3	3.1
Hogs	12.1	23.7
Sheep	2.0	.0
Chickens	177	127
Turkeys	14.2	.0

"Table 2 appears on page 14.

Table 2.--Total number of various types of machinery and average age on 19 farms in the Central Great Plains Experimental Watershed, Hastings, Nebr.

	1939		1951	
	Total No.	Age	Total No.	Age
Automobiles	19	9.7	24	9.4
Trucks	0	---	7	5.7
Trailers	0	---	16	---
Wagons	20	---	30	34.5
Subtiller	0	---	1	4.0
Corn sheller	1	10.0	2	13.5
Enslige cutter	0	---	0	---
Packer	0	---	2	36.0
Treader	0	---	0	---
Mower, Tractor	0	---	7	4.0
Mower, horse	22	16.5	15	24.3
Threshing machine	1	16.0	2	22.5
Feed grinder	5	8.8	17	15.4
Grain drill	17	16.9	17	15.9
Cultivator, horse	33	16.0	7	24.6
Cultivator, tractor	0	---	18	4.5
Lister, horse	16	15.3	7	25.3
Lister, tractor	3	10.0	14	6.4
Planters, row crop	4	27.0	0	---
Hay rake, sweep	13	---	8	17.8
Hay rake, sulky	19	20.0	17	23.4
Spreader	0	---	12	25.0
Spring tooth harrow	0	---	14	3.8
Harrow	19	24.0	19	23.4
Disk	17	15.0	21	12.0
Plow, horse	27	20.0	8	35.0
Plow, tractor	1	10.0	17	6.6
Plow, disk	1	6.0	0	---
Corn binder	2	18.5	5	26.6
Corn picker	0	---	9	3.9
Grain binder	18	16.5	14	28.3
Combine	1	2.0	12	8.1
Tractor	7	7.5	20	5.8
Go-Dig	21	17.5	16	22.9
Buggies	6	---	0	---
Total	293		378	

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"March precipitation was 45 percent below 'normal' at the Throckmorton Farm, but near 'normal' at the Dairy Farm, about 10 miles away. There was no important runoff from the experimental watersheds at either location.

"Runoff data were compiled for the February 20 storm referred to in our previous report. Approximately 1/2 inch of rain on the 18th had thawed the remaining snow and frost near the surface had gone out of the soil, so that it was probably near saturation at the surface when the 1.65 inchesof rain fell on the 20th. The following table summarizes the resulting runoff from the rotation-crop watersheds:

Table 1.--Runoff from experimental watersheds according to types of cover and land management, from 1.65 inches of rainfall, February 20, 1951, Purdue-Throckmorton Farm, Lafayette, Ind.

Crop cover	Type of management*	Runoff % of R/F
Meadow (2d yr.)	Prevailing	33
	Conservation	20
Corn Stalks	Prevailing	36
	Conservation	7
Wheat	Prevailing	67
	Conservation	45

*Prevailing System = straight row seeding and cultivation, common fertilization practices;

Conservation System = contour seeding and cultivation, increased fertilization, deep rooted legumes, increased organic residues returned to the soil.

"It appears that the contour ridges remaining from cultivation of the corn and corn stalks knocked down in the direction of the contours by the picker provided important protection through the winter.

"Comparative data for soil and organic matter losses from corn and soybeans are given in the following table for the most important runoff periods occurring during the past year

Table 2.--Erosion losses of soil and organic matter from experimental watersheds in corn and soybeans for four major runoff periods in 1950 Purdue-Throckmorton Farm, Lafayette, Ind.

Date	Prevailing treatment				Conservation treatment			
	Total solids		Organic matter		Total solids		Organic matter	
	Corn	Soybeans	Corn	Soybeans	Corn	Soybeans	Corn	Soybeans
	Lbs. per acre							
6/16/19	5,308	5,638	160	168	1,164	3,080	60	111
6/24	7,504	4,667	172	130	2,566	2,080	82	77
7/19	156	1,590	6	42	0	68	0	3
9/21	530	71	29	4	8	2	1	--

"In considering those losses, it should be borne in mind that the corn followed meadow in the rotation; whereas, the soybeans were 2 years removed from the meadow.

"Conferences we held with Mr. J. R. Humphrey's Branch Manager of the Oliver Corporation, South Bend, and Mr. Oscar Ackerson, Agronomy Specialist, SCS Operations in Northern Indiana, regarding results of Experimental Tillage Treatment No. 5 using the Oliver 'TNT' plow (discussed in detail in our report for February), and the desirability of field tests this year, of this method of seed-bed preparation for corn by a limited number of farmers. It was suggested that such tests, if undertaken, should be limited to a small number involving only small acreages, preferably not too far away from the Albion experimental plots. Mr. French, Oliver representative at Broman, Ind., and Mr. Ackerson are exploring the details as to locations, equipment, etc. If such tests are undertaken, we shall be able to serve only in an advisory capacity in getting them under way and to make observations on them during the season, etc.

"We also conferred with Mr. R. R. Poyner of the International Harvester Co. in regard to his plans for field testing his experimental mulch tiller-planter on private land in the vicinities of Lafayette and Rochester, Ind.; and also the possibilities for some experimental use of the machine on the Throckmorton Farm again this year, for comparison with other mulch tillage practices being tried there. We shall also plan to make informal observations during the season of the tests with this machine at other locations."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The March rainfall of 4.09 inches represents 66 percent of the 70-year average of 6.20 inches for Auburn.

"One rain of 2.05 inches which fell March 18 and 19 caused runoff and soil loss from the erosion plots. A summary of the water and soil losses is given in table 1.

Table 1.--Soil and water losses from erosion plots, Auburn, Ala. March 18 and 19, 1951 - rainfall 2.05 inches

Plot No.	Slope percent	Vegetative cover	Water loss inches	Soil loss lb./acre
1	2-1/2	Bare - seeded to alfalfa	0.17	0
2	5	Crimson (poor stand)	.14	0
3	5	Crimson and rye (2" high)	0	0
4	5	Crimson and cotton stalk mulch	0	0
5	10	Oats, fescue (2" high) and Ladino seedlings	.38	0
6	10	Crimson and cotton stalk mulch	0	0
7	10	Crimson (poor stand)	.47	2,205
8	10	Crimson (poor stand)	.33	2,110
9	20	Crimson and cornstalk mulch	0	0
10	20	Crimson and cornstalk mulch	0	0

"In cooperation with SCS Operations personnel, 20 infiltration measurements were made using the simulated rainfall type-F infiltrometer (table 2, page 16). These tests were made in Mobile and Baldwin Counties on Lynchburg F.S.C.L., Norfolk F.S.L., Marlboro F.S.C.L., Faceville F.S.C.L., Norfolk sand, Norfolk L.S., Orangeburg F.S.L., and Red Bay F.S.L.

Table 2.--Summary of infiltration tests made with the infiltrometer on Alabama soils (March 1951) 1/

Test No.	Soil type	Soil surface condition	Depth of topsoil	Infiltration				Initial soil moisture			
				Total		Rate at end of		Depth (in.)			
				1st hr.	2d hr.	1st hr.	2d hr.	0-6	6-12	12-18	18-24
				In.		In./hr.		Percent			
73, 74, 75, 76	Lynchburg F.S.C.L.	Fair legume & grass sod	6	1.06	0.65	0.78	0.58	9.85	10.25	10.17	10.63
78	Norfolk F.S.L.	Poor grass mulch	8	1.33	.86	.97	.67	9.27	11.13	11.60	12.34
79, 80	Marlboro F.S.C.L.	Good grass & clover sod	7	.67	.06	.12	.04	17.97	15.59	16.10	16.11
81, 83, 84	Faceville F.S.C.L.	Fair oats & clover sod	7	.74	.26	.31	.24	9.40	11.15	12.63	14.93
85, 86	Norfolk sand	Bare loose	6	3.03	2.26	2.59	2.09	8.34	7.44	7.73	7.78
87, 88	Norfolk L.S.	Bare loose	8	1.79	1.42	1.52	1.39	11.70	9.66	9.19	9.69
89, 90	Orangeburg F.S.L.	Bare loose Slightly packed on surface	8	1.57	1.12	1.16	1.04	12.90	13.58	14.04	15.28
91, 92	Red Bay F.S.L.	Bare firm	8	1.54	.76	1.06	.74	16.39	14.64	15.69	16.00

1/ Datta obtained jointly by SCS Research and Operations.

"Mr. Lockett made permeability determinations on 16 soils (table 3, page 19).

"At the request of Mr. T. G. Amason, District Conservationist, Wiregrass Soil Conservation District, the Project Supervisor accompanied Mr. Stephens, State Soil Scientist, to Geneva County on March 28 to observe terrace-maintenance problems. Mr. J. K. Howard, Work Unit Conservationist, Geneva County, spent the day showing how ridges are being formed above the terrace channels and how channels are being formed in the middle of the terrace intervals by improper terrace maintenance and land preparation.

"This same problem exists all over the State. It is a result of plowing the land the same way each year with one-way plows. Although this situation can be corrected by varying the method of plowing each year, Mr. Howard and the County Agent, Mr. Woodham, feel that it is impossible with limited personnel to teach all the farmers of the county (60 percent tenants) the various methods necessary to keep their land in good shape.

"The possible solutions to keep the land in better condition that were discussed were the use of two-way plows or subsurface tillers and disk harrows. Trials need to be made in each section of the State to check the effect of subsurface tillage and disking on crop yields and weediness."

Hydrologic Studies - L. H. Stolzy, East Lansing, Michigan.-"Precipitation for the month of March, as measured by the U. S. Weather Bureau type of stand non-recording rain gages, amounted to 1.54 inches at the cultivated watersheds, 1.76 inches at the wooded watershed, and 1.54 inches at the stubble-mulch plots. These amounts are approximately 66 percent, 75 percent, and 66 percent respectively, of the 50-year average March precipitation of 2.35 inches. March precipitation can be expected to equal or exceed 2.35 inches once in 2.10 years. The precipitation occurred in three distinct periods of 3 days each, one at the first, one in the middle, and one the last of the month. The precipitation on the 29th was the first thunder storm of the year. Each of these rainy periods was accompanied by some snowfall which melted shortly after reaching the ground. The watersheds were without snow cover for the month.

"Both watersheds contained a frost layer on March 1. This frost layer extended from the 0- to 9-inch depth but was not uniform throughout the watersheds. This frozen condition disappeared with the rains from the 1st to the 3d of March. The soil was free of frost for the rest of the month except for occasional freezing from the 0- to 1-inch depth.

"Both watersheds 'A' and 'B' had one runoff during the month of March. This runoff occurred on the 3d and amounted to 0.04 inch for watershed 'A' and 0.02 inch for watershed 'B.' This runoff was the result of frozen soil conditions and so, consequently, low infiltration rates for the soil.

"A meeting of the Station Committee was held on March 1. The members present were as follows: Dr. Turk, Chairman, Mr. Sackrider, Dr. Hardin, Dr. Harrison, Dr. Kenworthy, Prof. Kidder and Prof. Cade, as well as two representatives from the Forestry Department, Dr. Stevens, who is Head of the Forestry Department, and Prof. Dils. The purpose of the meeting was to discuss proposed research for the ensuing year. The main topics of discussion were the replacing of present soil-moisture and soil-temperature units at the cultivated watersheds and the installing of soil-moisture and soil-temperature units at the wooded watershed, as well as altering

Table 3.--Permeability of soils (Alabama) 1/

Depth	Field moisture content	Moisture content saturated	Percolation		Volume weight	Water drained	
			Field moisture	Saturated		15 min.	15. hr.
Inches	Percent	Percent	In./hr.	In./hr.	Gm/cc	Cc/100 sq cm	
Soil Unit #31							
0"-3"	3.95	28.20	2.40	3.84	1.54	7.80	11.82
6"-9"	5.90	26.43	1.79	3.02	1.35	8.43	15.30
12"-15"	7.26	33.44	8.14	13.99	1.46	13.93	17.33
20"-23"	10.62	31.77	3.15	5.68	1.53	9.42	13.27
Irvington sandy clay loam							
0"-5"	19.95	58.89	12.89	10.41	1.07	18.82	28.26
5"-7"	15.40	31.58	.03	1.84	1.56	7.39	12.50
17"-42"	12.78	33.00	.57	2.68	1.62	9.58	14.92
Carnegie F.S.L.							
0"-6"	10.55	36.71	.94	2.75	1.37	4.95	12.85
6"-14"	8.73	36.57	1.70	12.74	1.40	10.82	17.40
14"-42"	8.75	27.43	6.61	13.04	1.68	7.51	12.15
Rustom F.S.L.							
0"-8"	2.45	36.16	13.49	10.20	1.40	13.79	21.08
8"-23"	4.68	27.69	1.87	6.72	1.59	9.26	14.39
23"-42"	5.46	27.14	2.05	6.07	1.63	7.47	12.87
Irvington F.S.L.							
0"-8"	8.95	51.04	21.06	5.55	1.13	18.90	27.85
8"-20"	14.54	33.60	.45	4.64	1.50	8.64	14.22
20"-42"	11.27	27.29	7.80	12.26	1.72	8.95	12.71
Irvington F.S.C.L.							
0"-3"	11.22	39.48	2.13	2.64	1.37	11.13	20.63
13"-16"	11.00	27.90	1.00	3.15	1.65	8.44	14.33
21"-24"	13.07	33.08	1.28	4.71	1.53	10.08	16.46
Plummer sand							
0"-3"	16.92	43.24	39.04	16.59	1.26	12.06	18.14
13"-16"	12.87	31.10	5.27	3.37	1.51	9.61	14.04
20"-23"	11.06	24.38	1.36	.91	1.69	5.79	9.84
Potato Land F.S.L.							
0"-3"	7.83	53.24	13.02	6.05	1.16	18.09	26.79
13"-16"	9.88	34.21	1.36	6.91	1.55	9.21	16.39
21"-24"	9.02	34.99	.95	5.55	1.56	9.57	16.29

Table 3.--Permeability of soils (Alabama) 1/ - Cont'd

Depth	Field moisture content	Moisture content saturated	Percolation		Volume weight	Water drained	
			Field moisture	Saturated		15 min.	15. hr.
Inches	Percent	Percent	In./hr.	In./hr.		Cc/100 gm	
Faceville F.S.C.L.							
0"-3"	9.58	31.26	1.56	1.86	1.53	7.06	13.75
7"-10"	9.43	31.87	2.48	12.70	1.51	11.56	18.19
20"-23"	12.72	31.54	3.93	14.60	1.54	9.66	15.22
Rustom loamy sand							
0"-3"	1.97	34.57	8.29	10.17	1.46	13.74	24.32
12"-15"	2.08	33.71	11.12	21.73	1.47	19.75	27.01
20"-23"	2.60	37.69	18.83	23.84	1.40	24.24	31.12
Lynchburg F.S.C.L							
6"-9"	8.07	33.78	3.65	7.17	1.43	10.49	17.55
20"-23"	8.98	33.17	5.21	3.67	1.47	13.51	19.60
30"-33"	12.24	29.90	1.84	3.46	1.55	9.25	14.69
Marlboro F.S.C.L.							
0"-3"	11.48	30.93	1.32	1.43	1.47	5.90	11.39
6"-9"	8.47	30.38	1.20	5.08	1.54	8.13	13.91
20"-23"	10.58	30.97	.59	5.25	1.61	9.63	15.01
30"-33"	11.69	31.72	.48	3.89	1.61	9.64	14.40
Norfolk Loamy sand							
0"-8"	8.30	37.44	26.82	4.31	1.17	16.92	25.94
8"-22"	8.02	32.24	11.14	13.22	1.48	17.47	24.15
Orangeburg fine sandy loam							
0"-8"	8.54	37.92	11.95	12.04	1.38	16.44	25.05
8"-22"	11.20	34.42	6.37	17.28	1.46	13.66	21.42
22"-42"	12.34	28.63	3.39	11.01	1.59	8.40	15.09
Norfolk sand							
0"-6"	24.71	59.93	24.81	32.46	1.17	24.02	32.07
6"-40"	3.88	28.90	28.83	37.51	1.48	20.91	26.15
Red Bay fine sandy loam							
0"-8"	7.78	50.42	34.01	7.84	1.10	20.81	30.23
8"-22"	9.64	31.05	3.74	8.80	1.49	11.12	17.71
22"-44"	10.42	30.04	2.79	4.51	1.55	10.71	15.15

1/ Data obtained jointly by SCS Research and Operations.

the present forest cover at the wooded watershed to give additional data on the effects of watershed management on soil and water loss. The first two topics were covered thoroughly in an outline presented at this meeting in which procedures and costs were included. This was approved by the Committee and sent to Dr. Nichols for his approval.

"The last topic of discussion which was presented by Dr. Stevens of the Forestry Department was discussed considerably by various members of the Committee. Some felt that the watershed should be pastured as well as clear-cut, while others thought that the animals would only serve to confuse the data received on this watershed. At the close of the meeting Dr. Turk appointed Dr. Stevens, Mr. Sackrider, and the Acting Project Supervisor to investigate the conditions more thoroughly at the wooded watershed and make further recommendations to the Station Committee.

"On March 6 Dr. Stevens, Mr. Dils of the Forestry Department and the Acting Project Supervisor investigated the wooded watershed and surrounding area to determine if it would be feasible to make a study on the effects of pasturing a farm woodlot. It was felt, after looking over the area, that it would not be possible to pasture the wooded watershed along with the surrounding area and obtain worth-while data on soil and water loss. The reason was that there would be no control of the cattle on the watershed, in that the watershed alone would not be large enough to be pastured and so the surrounding area would have to be used.

"The Committee decided that the best method for obtaining additional data from the wooded watershed on water and soil loss would be to clear-cut the watershed of all merchantable timber. This decision was discussed with the various members of the Station Committee and their approval was obtained. The Forestry Department is planning on writing up an outline of procedures to be followed in regard to this study. These procedures will be sent to the Soil Conservation Research and the Michigan Conservation Department for their approval.

"On March 20 Dr. Turk, Dr. Tyson and the Acting Project Supervisor met to discuss the stubble-mulch plot studies. These were discontinued temporarily in 1949. Dr. Millar and Mr. Crabb were authorized by Dr. Nichols to make trips to other stations where stubble-mulch studies were being carried on. The results obtained from these other stations and from our own stubble-mulch study would be used as a guide to start a new series of stubble-mulch plot studies. After a period of 2 years it is planned that the results obtained from this new stubble-mulch plot study can be applied to one of the cultivated watersheds to determine if it is practicable for Michigan.

"As Dr. Millar and Mr. Crabb were both absent, no definite conclusions were arrived at. However, Dr. Turk contacted Dr. Millar by letter as to what they had decided, and he indicated that both Mr. Crabb and himself thought that Virginia had the most promising work in trash or stubble-mulch culture. They planned on applying some of the methods used there on the experimental plots which consisted of running the top moldboard of the Oliver T. N. T. plow about 3 or 4 inches deep and the lower share about 7 or 8 inches deep. Disking accompanied this operation, either before or after. The Virginia station received best results from disking after plowing. Dr. Millar indicated that this was the only promising method of all that were investigated. The Soil Science Department under Dr. Tyson will make the plot study for the next 2 years."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Holtan makes the following report:

"All of the runoff data at this office have been scanned for applicable information on hydraulics of flow. Since no more could be done upon this phase until more data become available, efforts were turned to the development of infiltration estimates for the watersheds under consideration of flood control at Staunton, Va.

"Messrs. Holtan and Kirkpatrick reviewed the infiltration data available for estimates of limits of infiltration capacity imposed by land use alone. These estimates were made from infiltrometer runs on very open, highly permeable soils for various vegetative covers.

"Messrs. G. V. Wilson and W. L. Turner, Conservation Survey Supervisor and Soil Scientist, respectively, provided estimates of soil permeability for the areas of Flood Control Watershed A-1 at Staunton, Va. Storage capacity and capacity permeability of each horizon were used to compute the infiltration limits for each soil (i. e., the mass curve of water transmission through consecutive horizons).

"In estimating the infiltration capacity for each soil-land use complex, the lowest limit imposed by either land use or soil profile was used. The cartographic division had already supplied figures on acreages in each land use for each soil classification so it was purely a mathematical labor to compute the watershed infiltration curve by weighting each 'complex' curve according to its percent of watershed area.

"Due to the fact that some soil-land use complexes have infiltration capacities which are in excess of Yarnell's 10-year frequencies but are not as great as the less frequent intensities, it was not possible to compute one curve of infiltration for this watershed for application generally. It was found that the 100-year frequency storm will have a greater infiltration than the 10-year storm. If the 100-year infiltration capacity curve were applied to a 10-year storm, it would be the same as permitting infiltration to exceed rainfall in some areas."

"On March 20, Mr. L. A. Jones, Chief, Division of Drainage and Water Control, visited the project and discussed in detail the work that is being done in conjunction with flood control in the testing of the application of the Holtan-Kirkpatrick analytical procedure. Emphasis was placed on the fact that these procedures were being tested as a tool for watershed comparison and that they would not be relied on to provide flood frequencies, but would be used in conjunction with other analytical procedures.

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-"On March 30, the Project Supervisor met with personnel of the Robert E. Lee Soil Conservation District and Mr. R. C. Jones, Zone Engineer, to determine suitable methods to be applied on the Natural Bridge Hotel pond. This pond has failed to hold water since construction. The investigation showed that this failure was due primarily to the removal of the soil mantle from the highly creviced and cavernous geological formations beneath the pond bottom. SCS personnel had advised the manager to avoid the removal of such soil. His contractor had not, however, followed these instructions. The suggestion was made that a clay bonding mantle be constructed over the pond bottom in accordance with procedures that have been determined by Mr. Holtan. Some preliminary soil tests will be made to provide specifications for the preparation of the clay bonding mixture."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville for March was 2.51 inches. The resulting runoff was about 0.80 inches. There were no high rainfall intensities during this period. Temperatures varied from a maximum of 78 degrees on the 23d to a minimum of 15 degrees on the 21st, with the mean for the month 38 degrees or nearly normal.

"Precipitation at Fennimore for March was 3.76 inches. About half of it was in the form of snow. There were no high intensities and the total surface runoff amounted to 0.30 inch. The winter cover of snow melted during the first half of the month and was all absorbed by the ground which had been frost free. The surface of the ground froze following this clearance of snow and the entire runoff of 0.30 inch was the result of melting of subsequent snow. The 1.90 inches of rainfall during the last 4 days of the month caused no surface runoff indicating the soil was again free of frost. Temperatures varied from a maximum of 50 degrees on the 27th to a minimum of 9 degrees on the 2d, with a mean of 25 degrees or near normal."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"The half-time graduate student working on the pipe drop inlet study was able to complete one test series on a drop inlet 1.25 D square by 4D deep. The entrance to the barrel was square edged, the pipe slope was 30 percent. The results indicate that this riser depth is the minimum that can be utilized with the type of drop inlet and the pipe entrance used if we are to be sure that the barrel will flow full without causing serious fluctuations in the head pool. The tests also closely checked the method used to determine the minimum depth of riser, which was based on a test made with the drop inlet only 2D deep.

"The test setup has now been revised to study a drop inlet 2D square by 3.5 D deep.

"The test setup for the straight drop spillway experiment was essentially completed during the month. The constant-level tank, supply piping, approach channel, measuring flume, test channel, and first model were installed. The measuring flume will have to be calibrated and the point gage carriage used for depth measurements will have to be installed before experiments can begin. This installation was completed with a minimum of expense and effort by making maximum utilization of the apparatus previously used for the box inlet drop spillway studies. Some time was spent in the study of published information that can be used to facilitate the study and in making detailed plans for the initial studies.

"A training conference for the engineers located in Iowa was held on March 28 and 29. Originally scheduled for the previous week, it had to be postponed because falling snow and blowing snow drifted roads shut so fast plows could not keep even main roads open and any attempts to travel between Iowa and Minnesota would have been foolhardy. Twenty-five engineers attended this conference. The group included 14 work-group engineers, 3 engineering specialists, 4 Flood Control squad leaders in the Sioux City office, R. A. Wilcox, assistant State conservationist in Iowa, Neal Minshall, hydrologic research project supervisor at Madison, Wis., Harold P. Guy, agricultural engineer on the staff of the Iowa State College at Ames, and Jesudasan Walter, engineer for the public works department of Madras, India, who is spending 2 weeks at the Laboratory. The group was a little large to get the maximum benefit from the demonstrations when gathered around the demonstration channel, but the lecture facilities were adequate for a much larger group. The keen interest and searching questions made our efforts seem well worth-while.

"Our training conferences have been attended by engineers from Minnesota, Iowa, Wisconsin, Missouri, and Illinois, as well as the Region 3 office engineering staff, many Region 3 water-conservation engineers, and the Region 5 office engineering staff, engineering specialists, and zone engineers. Now that the neighboring States have led the way with sending their engineers to the Laboratory for training in the hydraulics of soil and water-conservation structures, it is hoped that some means can be found so the more distantly located engineers can receive similar training."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"We are well under way with the installation of the pipe outlet experiment for Ft. Worth. I have pushed this job as hard as possible because I want to beat the rainy season. In fact for the past few weeks I have spent all my time at the laboratory. To date on the pipe outlet we have:

1. Completed the concrete work for the crossing and cut-off at Supply Canal Station 12+ 30.
2. Completed the 4 foot Parshall Flume.
3. Installed a cut-off gate across Lateral 5.
4. Poured the based for the crossing and cut-off structure at Supply Canal Station 6 + 62.
5. Laid and bedded the 108 feet of 24-inch concrete pipe. This is complete with 7 piezometer taps and gage lines.
6. Poured the base. for the inlet structure for the 24-inch pipe.
7. Cleared and brushed the line for the 260 feet of 24-inch corrugated line. The excavation is also complete except for the last 50 feet.

"I expect that the construction of the reservoir and dikes will be started next week. This is a 4,000 cubic yard job so we have contracted it. The bids were opened in Ft. Worth last Friday. This earth work probably will be started while I am on leave so I have arranged to have Maurice Cox of Guthrie supervise this part of the work.

"We have run into some problems on the use of culverts for rate measuring devices on our runoff study. The culverts on the watersheds we chose are 70 feet long. Also they have a steep slope. This makes it difficult or impossible to use a Villemonte weir sill. To meet this problem we are resorting to model studies. We have set up a small flume for this purpose. We have just started the rating tests. So far we have rated one culvert without weir sills. Tomorrow we'll try it with the sills in place. Most of this work is being done by Frank Crow of the Agricultural Engineering Dept. together with a graduate student assistant. We have made good progress the past month despite the fact they can work at it only 2-1/2 days a week.

Supplemental Irrigation Studies - J. R. Carreker, Athens, Georgia.-"Wm. B. Land reported climatic observations in March at the irrigation plots as follows:

"Rainfall, 5.56 inches, well distributed during the month. Evaporation, 3.56 inches. Wind movement, 1,486.5 miles. The maximum and minimum temperatures recorded were 83 and 26 on the 2d and 26th, respectively. There were 9 days with the

minumum temperature below 32° F.

"Some land preparation work was done at the plot sites on the University farm and the Watkinsville Station. Other jobs were carried on in preparation for the several studies to be conducted.

"Fertilizer was applied to both the fescue grass and the Dallis grass based pastures, including 300 lb/ac 0-14-10 and 100 lb/ac 33 percent ammonium nitrate. Dry phosphate and potash (0-14-10) were broadcast uniformly over all areas. Ammonium nitrate was dissolved in water and applied to strips 60 feet wide in each paddock. The remaining area outside these strips in each paddock received the ammonium nitrate in dry form. Vegetative growth from these 2 methods of fertilizer application will be obtained by herbage clippings from caged areas.

"John R. Carreker spent Friday, March 30 assisting Zone Conservationists, J. T. McAlister and E. V. Frederick and Work Unit Conservationist John F. Bradley with an irrigation problem on the farm of Bennett and H. O. Thomas in Morgan County, Madison, Ga.

"Messrs. Bennett and Thomas have a large dairy farm, with about 125 cows in production now. The quantity of milk marketed on the base (high) price is determined by the actual amount shipped during the base period of September, October, and November each year. The normal surplus of milk each spring above the fall base production has to be sold at a reduced price. Therefore, maximum production in the fall means increased income the entire year.

"The breeding program, grazing schedule, and feeding arrangements have been designed for maximum fall production. Messrs. Bennett and Thomas are very interested in maximum utilization of the water resources on their farm to prevent slack periods in grazing due to dry weather.

"Two ponds were built in 1950 for sources of irrigation water. It is apparent that these ponds will supply only a limited amount of water in relation to the needs.

"Two good branches join on this farm within one of the pastures and near an alfalfa field. The point of discussion March 30 was pertaining to the construction of ponds on these streams and then the full use of water from them. Several possibilities were discussed. Specific recommendations were made regarding each alternative.

"Messrs. Bennett and Thomas both have College degrees in Agriculture. They are approaching the use of irrigation on their farm from sound technical and economic viewpoints. Their operations would be an excellent place for us to obtain a great deal of information on a field trial basis."

Supplemental Irrigation - T. W. Edminster, Blacksburg, Virginia.-"Mr. J. N. Jones, under TVA contract with the Experiment Station, makes the following report:

"On the irrigated control plots, a special study will be conducted with burley tobacco, making use of 13 plots. This department will collect all data as near as possible with the Plant Physiology Department acting in an advisory capacity. The exact moisture levels to be maintained and rates of application for the experimental design have not been fully established as yet.

"Manure has been applied to these plots and soil samples have been taken to determine the potash content primarily."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"Project staff members attended a conference at Lakeland, Fla., conducted by R. Y. Bailey, Regional Research Representative, on March 1 and 2. Operations personnel were also present at this meeting and problems were discussed by Operations on which more information was desired for routine operational work. The work now being done by Research in this State was outlined and a tenative procedure was set up for certain observational studies to be conducted jointly by Research and Operations and a steering committee was appointed to expedite this work.

"The remainder of the hydrologic equipment for the Indian River Farms Drainage District Study Project was installed and put into operation near Vero Beach. This additional equipment consisted of three recording rain gages; two Bristol recording pressure gages, which were installed on idle artesian wells to record pressure variations, and a Class 'A' Evaporation Pan."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall during this period was very light; for the 17 rain gages scattered throughout the area, rainfall varied from 0.08 to 0.56 inch, with an average of 0.30 inch. All of the rains occurred as very light showers on March 10, 13, 15, 21, and 30.

"In connection with the moisture studies, during the past period during which little or no rain fell and strong winds blew almost constantly, we found at the Sunland Grove plots that even on the plots which received two 1/2-inch applications per week, our readings were high almost reaching the wilting point. During periods of extremely dry weather it is very difficult in these shallow soils to maintain adequate moisture relationships.

"Samples collected in the Miami area since January 1950 have shown a definite build-up of chlorides in many parts of the area. While the concentration has not increased as it did in 1946, the sampling on March 14, 1951, showed that in many areas the concentration had built up to the point where it might be harmful to tender crops. The structures are apparently functioning, as data from USGS canal water shows the concentration low, but the trouble during the past year has been that we had low rainfall in all of south Florida and all the chlorides were not completely flushed out of the soil. Then too, the structures may have been left open too long and too much of the fresh water was allowed to flow out of the area.

"Samples collected from our chloride lines in the Homestead area show that there has been a definite increase in the concentration of chlorides in the coastal area to a point about a mile west of the structures. As in the Miami area, USGS sampling of the canal waters shows that the concentration in the canals has been held down. Indications from analysis of our samples throughout this area are that the increase is probably due to two factors: rains during the past year have been light and we did not have heavy enough or frequent enough showers to completely flush out the chlorides and in all probability the structures remained open too long allowing the fresh water to flow out of the area.

"Some of the trouble is no doubt due to the great number of small unprotected ditches which still are unprotected in the area. As I have stated many times until all of these small ditches have control structures we can expect contamination.

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"During the month of February, trencher designs were made of a new type digging unit to use with the 306 Buckeye trencher which the company has left with us for experimental purposes. As soon as the shop is completed and funds can be made available, construction will be started."

Muck Drainage Studies - R. B. Hickok, Lafayette, Indiana.-"Mr. Jongedyk has compiled the following report of observations made last fall relating depth of previous drainage to differences in the present appearance of the soil profiles and their present characteristics.

"The profile of the muck soil at the Northern Indiana Muck Experiment Farm was examined at several places on various experimental drainage plots. The similarity of the vegetation remains and morphology of the soil profile at these different locations indicate that the muck soil on all the drainage plots was probably about the same at the beginning of the experiment. As a result of maintaining different water tables on the various experimental drainage plots, definite changes have occurred in the physical structure of the soil, especially as it relates to drainage. The differences are probably as great as they are because all but the most shallow water-table plots have been drained more deeply than ever before. Illustrated below is an example of the extreme difference occurring in the physical characteristics of the soil as noted during 1950:

Table 1.--Noted physical features of two different soil profiles from different muck experimental drainage plots, Northern Indiana Muck Experiment Farm, Walkerton, Ind.

Plot No.	4	8
Av. Water table (1944-1950)	1.4 feet	3.3 feet
Soil profile (depth below surface)		
0.0' - 0.6'	Black, loose muck (Very small crumbs)	Black, loose muck (Very small crumbs)
0.6' - 2.1'	0.6'-0.9' Brown to black, peaty muck (Large Granules. Some partly decomposed plant material)	0.6'-2.0' Black peaty muck having large crumbly aggregates and some peat. (Plant roots abundant. Soil extensively cracked. Many horizontal and vertical worm holes. Cracks less common below 1.5'. Some trace of wood knots 1.5' to 2.0'.
	0.9'-1.2' Brown to yellowish-brown mucky peat. (Spongy and compact. Sedge remains).	
	1.2-2.1' Large irregular wood knots with light brown spongy peat. (No cracks, roots, or worm holes, soil not crumbly)	
	At 2.1' sharp change. Horizontal cleavage plane.	At 2.0' Horizontal cleavage plane.
Below 2.1'	Yellowish-brown, fibrous, compact spongy, raw peat.	2.0'-3.0' Light brown mucky peat Worm holes to 2.8'. Fibrous and spongy. Not compact. Below 3.0'[1]/

1/Yellowish-brown, fibrous, compact, spongy raw peat.

"It may be noted that the soil is most appreciably changed from peaty material above the level of the average water table.

"The multitudinous cracking of the soil, worm holes, and plant root holes, which seem to have developed in the subsoil layers, apparently have been very important in improving drainage properties of the whole soil. There are some indications that the decomposition or oxidation of the soil, which is an important cause of subsidence, has been important in producing the changes noted in the soil.

"During October 1950 when the water table in five of the experimental plots had been uniformly drained to about 10 inches below the surface, field observations indicating the capacity of soil to drain were made. Using a 4-inch post-hole digger, holes were dug on those five plots to a depth of 1 foot below ground-water level (indicated by nearby wells). The ground-water level was marked on the side of the hole, and the time for water to seep into the hole to ground-water level was measured. The variations in the time for the level to come to equilibrium with the maintained ground-water level are shown below:

Table 2.--Relation of previous average water-table depth to tile for water to fill holes to ground-water level drainage plots, Northern-Indiana Muck Experiment Farm, Walkerton, Ind.

Plot No.	4	5	6	7	8
Ave. Water-Table Depth, Crop seasons 1944-50 (ft.)	1.4	1.3	2.3	2.1	3.3
Av. Time for water in hole to rise to ground-water level	15 hrs.	13 hrs.	2 hrs.	1 hr. 20 min.	31 min.

"The rate of rise of water in these holes is rapid at first (probably as a result of drawing in water from the ground in the immediate vicinity of the hole) and decreases with time. This type of field measurement (based upon one of H. C. M. Van Bavel's and Don Kirkham's drainage measurements gives a good indication of horizontal movement and total movement of free water."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Walter Turner has completed permeability runs on a number of sites from the residual stubble mulch plots and from certain of the Kipps farm plots to be used by Mr. Moody in his analysis of the structural changes in the soil profile as affected by the stubble-mulch procedures.

Mr. Walker makes the following report:

"The grouping and plotting of water-table draw-down curves from raw data were completed for the seven major tile draw-down investigations and the two open-ditch investigations.

"H. N. Holtan and the drainage engineer have been considering a method of determining the effect of soil permeability on the rate of water-table recession in artificially drained areas. If the present plan proves valid, it may develop into a method somewhat different than has been publicized so far. It is based upon the premise that the forces which move water into drains (either tile or ditch) act

along lines that are radial to the lateral at the point of drainage and that the velocity of the water is dependent upon the transmission rate of each soil profile layer. Therefore, the varying transmission rates occurring throughout the soil profiles are reflected in the rate of water-table recession.

"This approach differs from those used in many of the recent investigations in that they determined one permeability coefficient to represent the entire soil profile and the water was considered to travel an average distance to reach the tile.

"This method was applied to some of the data collected at the pump site on the Lee farm. For this site, calculated rates of water-table recession checks closely with the observed rates. Additional checks will be made using the data from the existing drainage systems observed.

"A verbal report which covered the general progress of the project was given to Mr. L. A. Jones, Chief, Division of Drainage and Water Control, when he visited Blacksburg, March 21."

"In the discussions with Mr. Jones, considerable emphasis was placed on the importance of shifting the emphasis in the Virginia drainage research program from tile studies to open ditch drainage problems. It was felt that with increased production demands brought about by defense activities that new lands would be brought into production upon which adequate ditch maintenance and improved surface drainage would be of particular importance. For that reason, places are now being developed for a program of research in that area that will facilitate development of such lands.

"The equipment on the Norfolk City Prison Farm were resurveyed, checked and adjusted by the Project Supervisor and Mr. J. H. Lillard.

"Considerable interest has developed in the possible application of the deep lime placement machine that was developed by this project in improving the productivity of the Nason and Tatum soils. The subsoils of these two soils are extremely acid, extremely low in calcium, magnesium, and available phosphorus. In addition, the subsoils have a much higher exchange capacity than the plow layers of the same soils. It is believed that by putting lime and phosphate in the subsoil that deeper rooting can be encouraged. Deeper rooting will provide for a larger effective soil pore volume and thus more available moisture and improved permeability relationships would exist. An informal cooperative arrangement has been developed with members of the Experiment Station Agronomy Department to study the use of this equipment near Orange, Va. The machine has been modified by the addition of a plow sole fertilizer attachment mounted behind the present lime boot on the subsoil beam. This makes it possible to introduce fertilizer materials at a shallower depth than at which the lime is put in. Plans are being made to put this study in early in April."

Sedimentation Studies - L. M. Glymph, Jr., Lincoln, Nebraska.-"On March 1 and 2, the Project Supervisortook part in a meeting of representatives of The Bureau of Reclamation, Geological Survey, The University of Nebraska, and the Soil Conservation Service at Indianola, Nebr., for the purpose of selecting sites for the collection of runoff, sediment load, and rainfall data within The Medicine Creek Watershed above Medicine Creek Reservoir.

"Medicine Creek Reservoir was completed by the Bureau of Reclamation last year. It is one of the systems supplying water for irrigation developments now taking place in the Republican River valley in western Nebraska. The reservoir had an original capacity of about 93,000 acre-feet and cost about 7.5 million dollars. It has a drainage area of about 650 square miles.

"Cooperative studies are being developed by the above interested agencies for the primary purposes as follows:

1. A basis for determining the rate and amount of sediment accumulating in Medicine Creek Reservoir.

2. A basis for dividing the Medicine Creek Watershed into sub-areas according to their importance as sediment sources.

3. Data on the rate of gully erosion and a basis for estimating the relative amount of sediment derived from gullies and sheet erosion in a portion of the watershed where gullying appears to be most active and where there is an important amount of cultivated land."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"During the month field work was continued on the sedimentation survey described in the February monthly report. Reservoirs surveyed and watersheds studied were as follows:

No.	Name	Location	Date
17	C. D. Williams	Lafayette Co.	3/1/51
18	R. X. Williams	Lafayette Co.	3/2/51
19	H. W. Ramsey	Lafayette Co.	3/2/5/51
20	Dr. E. J. Bramlett	Lafayette Co.	3/6/7/51
21	Albert S. Kyle	Panola Co.	3/8/51
22	Ben P. Smith	Marshall Co.	3/9/51
23	A. L. Rodman	Tate Co.	3/12/13/51
24	Chas. P. Dockery	DeSoto Co.	3/13/51

"Field work was stopped after completion of the Chas. P. Dockery reservoir on March 13. Mr. John W. Roehl of the Water Conservation Division, Regional Office, returned to Spartanburg for a period of computation of sediment in the surveyed reservoirs and of other needed quantities. Research personnel continued work on this study in the office at State College on classification of slopes, land use, and other characteristics of the watersheds used in the study. An attempt was made to complete all preliminary calculations in order to continue the work in further detail after the first of the month.

"Regional soil-decline rates were used in the computation of gross erosion on the watersheds. These figures were in the range from 0.36 inch per year to 0.45 inch per year on the basis of a 10 percent slope, 72 feet length of slope and 1.25 inches of rain in 30 minutes. On account of the wide variations of soil types within a problem area and frequently over a watershed, it was decided to use the arithmetic average of all of the rates applying over the entire area or about 0.41 inch per year average gross erosion rate for cultivated land. This was corrected upward on the basis of 1.35 inches of rain rather than 1.25 inches in 30 minutes and resulted in a figure of 0.47 inch per year.

IRRIGATION AND WATER CONSERVATION DIVISION

Infiltration Studies - K. Harris, Phoenix, Arizona.-"An infiltration study on a Cajon silty clay loam soil planted to lettuce March 3, 1951.

"In cooperation with the University of Arizona Vegetable Research Farm, an infiltration study was made on a Cajon silty clay loam soil, planted to lettuce. The lettuce crop on this field had turned a yellow, due to a high concentration of salts in the bed. Normally this ground should drain fairly well, and there should have been no effect from salt concentrations. Believing there was a retarding layer which would prevent the leaching out of the salt, Uhland core samples were taken in 3-inch sections down to 24 inches. There was a very definite retarding layer in the 12-18-inch depth. The soil again opened up below the 18-inch level.

"Figure 1, which can be obtained from the project, shows the lettuce bed and the retarding area. It also shows the disposition of the water after each irrigation. Because most of the water could not penetrate the impervious layer, much of it would move by capillary attraction up through the root zone, and evaporate from the soil surface, leaving an accumulation of salt in the lettuce bed.

"Figure 2, which can also be obtained from the project, shows the percolation rate of the water into the soil at the various depths. The restricting area shows up very well, and it can be seen why most of the water would evaporate from the surface before it would penetrate the 12-18-inch depth. It again opened up about to 1 inch per hour at the 24-inch depth.

"Probably the quickest method of reclamation would be to plow down below the impervious layer and let the ground air out good before cropping again. From here on, cultural practices should be followed which would not form another hard pan and cause a recurrence of the same trouble."

Water Spreading, San Joaquin Valley - D. C. Muckel, Pomona, California.-"Infiltrometers were installed in the two 6-acre tracts near Minter Field in the expectation that water would be available for the operation of these ponds this spring. The infiltrometers are designed to measure infiltration rates at various spot locations within larger ponds. Soil surveys indicated that most of the water entering the soil in these large ponds was taking place over about one-third of the entire wetted area. The remaining two-thirds of the area was considerably less permeable owing to subsoil conditions. This study may indicate whether or not a gin trash treatment should be concentrated on the areas not affected by subsoil conditions instead of treating an entire spreading area."

Water Spreading, San Joaquin Valley - Bakersfield, California.-"In connection with studies on the water-spreading test area near Minter Field, a group of metal sides square test ponds each 0.001 acre in size have been installed in different parts of the large ponds where permeability conditions appear widely different. These small ponds are designed so that depth of water in them will be regulated by water depth in the large body of water surrounding them. Their rate of water intake will be measured each day by closing the inlet ports and measuring the change in depth over a period of time. By means of these small ponds some measure of the quantitative effect of profile variations found on over-all permeability will be obtained. Since the small ponds are surrounded by large water area, the effects of lateral subsurface movement will be largely eliminated. One part of the test area has been treated with gin trash with another part held separate for 'control.' The small ponds will serve to measure the effectiveness of the gin trash treatment

on the naturally permeable and the naturally less permeable portions of the area."

Water Spreading, San Joaquin Valley - C. E. Joynson, Bakersfile, California.-"Organic matter decomposition studies were continued. Data are now available for the 15, 30, 60, 120, and 240-day decomposition periods. Alfalfa hay, cotton gin trash, Bermuda grass and redwood sawdust were the organic materials used in these tests. To date these tests show that the materials which decomposed the most rapidly (alfalfa tops and Bermuda grass tops and roots) during the initial 120-day period tend to decompose at a slower rate than the more resistant materials such as cotton gin trash and redwood sawdust during the following 4-month period. Under favorable conditions microbial activity may initially be higher in soils to which alfalfa hay or Bermuda grass tops and roots have been added than in soils which have additions of a more resistant material such as gin trash. However, after about 4 months decomposition the reverse may be true. This information may assist in solving some of the management problems involved in attempting to improve the infiltration capacities of soils by additions of organic residues."

Water-Supply Study - Techachapi Valley Soil Conservation District - W. W. Donnan, Los Angeles, California.-"During the past month the rainfall records of the Techachapi area have been analyzed. An index of wetness for each season has been calculated, using the 50-year mean annual rainfall as a basis for computing ratios. It has been found that the 50-year mean rainfall of the Tehachapi area is 12.78 inches, while the seasonal mean ranges from a high of 21.97 in 1909 to a low of 4.86 inches in 1947. By plotting a residual mass curve of the percent normal of rainfall, it can be shown that there have been two wet and two dry periods during the past 50 years. This curve also indicates that the aggregate deficiency of rainfall during the two dry periods in the last 50 years approached 100 percent of the mean.

"By placing the yearly rainfall records in order of magnitude, the following table of frequency has been prepared:

Table 1.--Frequency distribution of seasonal precipitation at Tehachapi Valley, Calif., 1900 - 1950

Recurrence interval	Seasonal rainfall	Percent normal of rainfall
Years	Inches	Percent
50	21.97	172
25	21.76	170
10	19.52	153
5	16.36	128
median	12.78	100
5	9.46	74
10	7.67	60
25	6.73	53
50	4.86	38

"These data serve to emphasize the complexity of the problem of determining the safe net yield of water for irrigation purposes in the Tehachapi area. If the research studies can show whether the rainfall which occurs -- say once in 50 years -- is stored underground by natural or man-made devices to be used in the years when there is such a tremendous deficiency, the estimated net safe yield of water for irrigation purposes can be increased."

Water-Supply Study - Techachapi Valley Soil Conservation District - G. Marvin Litz, Los Angeles, California.-"In connection with the cooperative water-supply study of the Tehachapi Valley Soil Conservation District, the 50-year normal annual precipitation expressed as acre-feet was computed from the isohyetal map for the valley floor area, foothill area and mountain watershed area for each of the three major drainage basins in the District. These amounts are tabulated below:

Area	Drainage Basin					
	Tehachapi Valley		Sand Canyon		Chanac Creek	
	Acres	Ac. ft.	Acres	Act. ft.	Acres	Ac. ft.
Valley floor	15,630	13.806	1,525	1,614	10,245	10,842
Foothill	17,909	19,774	7,410	7,842	2,625	3,172
Mountain watershed	23,739	36,243	18,612	26,852	15,598	23,044
Total	57,278	69,823	27,547	36,308	28,468	37,058

Evaporation Losses from Reservoirs - H. F. Blaney and G. M. Litz, Los Angeles, California.-"In connection with water-requirement studies, the mean monthly temperatures and monthly evaporation for the year 1950 at the cooperative stations maintained by the Southern California Edison Company at Florence Lake, Huntington Lake, Shaver Lake, and Kaiser Pass, Calif., were compiled from daily records. The following table gives the evaporation data:"

Year and month	Evaporation from Weather Bureau pan			
	Huntington Lake 1/ (Elev. 6,954 ft.)	Florence Lake 2/ (Elev. 7,345 ft.)	Saver Lake 3/ (Elev. 5,376 ft.	Kaiser Pass 4/ (Elev. 9,194 ft.)
1950	Inches	Inches	Inches	Inches
May		5.87	4.77	
June	5.90	8.08	7.51	3.83
July	8.37	8.59	9.49	8.45
August	7.46	8.18	8.84	7.73
September	4.44	5.01	5.15	4.68
October	3.45	3.60	3.92	4.35
November	.77		.89	

1/ June 6 - November 9.
2/ May 1 - October 26.
3/ May 10 - November 13
4/ June 16 - October 26

Infiltration in Irrigation Furrows - V. S. Aronovici, Pomona, California.-"The fifth irrigation furrow study was completed this month. The intake rate of a given section of an irrigation furrow was observed by means of V-notch weirs. The results obtained were compared with a set of four ring infiltrometers. Two units were placed in the furrows and two were placed in the tree row without any buffer ring or buffer pond. Uhland soil cores were taken from the irrigation furrow prior to irrigation and processing the samples was done in the laboratory. Table 1 on page 34, summarizes the results obtained. Note that the infiltrometers without buffer rings showed rates somewhat similar to the furrow while those placed in the furrow were considerably lower. Note that infiltration rates in the furrow observed by the infiltrometers compared with the 0-3 inches rate observed in the laboratory."

Table 1.--Summary of comparative infiltration and permeability rates with field performance of irrigation furrows 1/

Time from beginning of water application:	Ring infiltrometers: Without buffer ring No. 1	Without buffer ring No. 3	In furrow No. 2	In furrow No. 4	Furrow		Three-inch cores processed in laboratory (depth in inches): 0-3	3-6	6-9	9-12	12-15
Minutes	Ins./hr.	Ins./hr.	Ins./hr.	Ins./hr.	Ins./hr. per acre (2)	Ins./hr.	Ins./hr.	Ins./hr.	Ins./hr.	Ins./hr.	Ins./hr.
10	6.43	-	1.04	-	-	-	-	-	-	3.10	3.50
20	2.83	3.50	.90	3.10	-	-	0.75	2.20	2.10	2.50	2.84
40	1.30	3.10	.85	1.10	0.33	2.50	.60	1.70	1.60	1.70	1.70
60	1.35	3.00	.80	.60	.21	1.58	.45	1.15	1.25	1.40	1.30
100	1.30	2.90	.26	.55	.18	1.40	.33	.75	.65	.93	.95
150	.90	2.50	.18	.40	.18	1.35	.16	.55	.40	.69	.63
200	.85	2.10	.14	.35	.17	1.28	.14	.40	.35	.53	.58
250	.75	1.75	.10	.32	.16	1.20	.12	.40	.27	.46	.47
300	.55	1.75	.10	.30	.15	1.14	.15	.38	.23	.41	.41
350	.50	1.69	.10	.30	.17	1.30	-	-	-	-	-
400	.46	1.65	.06	.15	.18	1.40	-	-	-	-	-
450	.44	1.60	.07	.09	.15	1.13	-	-	-	-	-

1/ First irrigation following discing in heavy cover crop in citrus orchard.

Drainage Investigations, Imperial Valley - G. B. Bradshaw and W. T. Gish, Imperial, Calif.-"Leaching for 334 days under ponded water, have been completed on the heavy textured 140-acre Wilson leaching plot. During this time 2,963 acre-feet (or a depth of about 21.2 feet) of water was applied to the plot. Of this, 2,963 acre-feet (or a depth of about 21.2 feet) of water was applied to the plot. Of this 2,963 acre-feet applied, about 3.8 percent was removed by the tile drainage system. During the investigations a study was made of the movement of saline elements with respect to proximity to the tile drainage laterals. A compilation of data from the soil sampling stations at various locations adjacent to and midway between two tile-drainage laterals was made. The removal of saline elements from the midpoints between the tile laterals was slight during the first leaching run. The results bear out the leaching theory that more water flows to the tile drainage system from areas adjacent to the tile laterals than from points midway between them. There, also appears to be an increase in the percentages of saline content of the soil at the 5-foot depth over the original content before leaching at practically all stations. During the fourth and fifth long leaching run of 136 days the salinity between the laterals was greatly reduced. This reduction during the long fifth run was generally due to the salts being removed to depths up to 20 feet or more. This deep movement of saline elements was indicated by the 20-foot soil samples taken during the study."

Seepage Losses from Irrigation Channels - Carl Rohwer, Ft. Collins, Colorado.-"Analysis of the data on seepage collected last year was continued during the month of March. The permeameter tests made in the seepage rings at the Horticultural Plot show that it takes from a week to 10 days for the seepage rate to drop to the same level as that shown by the seepage rings. If observations were continued it was found that the seepage rate indicated by the permeameter continued to drop but at a decreasing rate. Tests in sandy soil at the Bellvue Laboratory did not show the same trend. However, it was observed that no algae grew in the water there, whereas a heavy growth occurred in the water at the Horticultural Plot. This difference may have had some effect on the permeameter readings because the algae would die inside the dark bell of the permeameter and the dead cells would tend to seal the pores in the soil. The validity of this assumption will be tested this summer by building a permeameter with a bell made of clear pastic.

"Sand Trap Report - "The analysis of the results of the tests on the effect of the shape of tube on the efficiency of the vortex-tube sand trap in removing bed load from canals has been completed. A preliminary report on this phase of the sand-trap study has been prepared. The tests show that the vortex tube is most efficient when there is a slight drop from the upper lip of the tube to the lower lip. They show too that better efficiency is obtained when the slope in the downstream side of the tube approaches the vertical because this shape reduces the tendency of particles to jump out of the tube. This design of tube is more efficient at lower velocities than the one with a flat slope. Attention has been given also to the study of the data on the effect of angle of tube on the efficiency of the vortex-tube sand trap."

Irrigation and Drainage Research in Utah - V. E. Hansen, Logan Utah.-"The Holton Corporation of Mobile, Ala., has recently placed on the market a spun-glass fabric pipe for use in carrying and distributing irrigation water under pressure. The tubing is advertised under the trade name 'Fibrylon Irrigator,' and has a light-weight fabric base of spun-glass with vinyl coating both inside and outside.

"The manufacturer claims a number of advantages for this product, among them being a saving of water through elimination of conveyancy losses, a saving of time and

fuel since long ditches need not be filled, the system serves rolling land where ditches may be impractical, little head land is wasted as is usual with ditches, the maintenance problem associated with irrigation ditches is eliminated, and the system is easily portable. This flexible pipe has been on the market such a short time that its use is still largely experimental and its limitations and real value are as yet not completely determined.

"Both the Operations and Research Offices of the Soil Conservation Service expressed considerable interest in the practical application of this new irrigation aid; however, through correspondence with the company, it was found that very little was known regarding the hydraulic characteristics of the flexible pipe. In order to answer the questions arising regarding the suitability of this material for irrigation, the deterioration of the material, the bursting pressure, and the measurement of flow from the discharge sleeves were investigated.

"The results of 1 year's testing show excellent resistance to rot and deterioration. Serious damage was caused to the stored fibrylon irrigator by mice. It may be that damage from rodents and mechanical damage incurred in ordinary field use may be far more consequential than organic deterioration.

"In the new condition the pipe withstood pressures of 20 psi.; however, after ordinary field use the bursting pressures were considerably less. It is interesting to note that in general the ruptures did not seem to originate at the seams. Often the break began at a small hole, scratch, or some other defect in the material. Surface damage to the fabric which can be caused in many ways materially lowers the bursting pressure.

"The sleeves with the drawstring controls were tested in the field under actual irrigation practice at pressures not exceeding 2 or 3 psi. For higher pressures, it was necessary to fold the sleeve before tying it in order to stop the flow entirely. Once the strings and, consequently the knots became soaked, it was very hard to adjust the flow. In general the drawstrings were not satisfactory. Because of these difficulties a metal hinge type of control was developed as a substitute for the drawstrings. The control consisted essentially of a strap hinge with a 3-inch bolt and nut. The sleeve was placed between the two leaves of the hinge, and the bolt placed through the end of each leaf with the nut to control the distance between the ends of the leaves. The separation of the leaves being proportional to the discharge results in a positive, easily adjustable control of the flow. Furthermore, when the hinge was placed relatively near the point where the sleeve was attached to the main pipe, the balance of the sleeve served as a very good energy dissipator, thus reducing to a minimum the erosion tendencies of the stream. In addition, the control is easily manufactured, inexpensive, and not bulky enough to seriously impede the flexibility and movement of the pipe.

"Head-discharge relationships were obtained for various hinge openings on the 7-1/2-inch diameter fibrylon irrigator having 3-inch diameter discharge sleeves. The resulting calibration attests to the accuracy and utility of the hinge type control. The detailed results are contained in a progress report. Further work is now under way as a master's thesis to further determine the hydraulic characteristics of this material."

Irrigation and Drainage Research in Utah - W. W. Rasmussen, Logan, Utah.- "An article by W. W. Rasmussen entitled 'Drainage Problems Follow Irrigation' was published in Farm and Home Science vol. 12, March 1951, No. 1"

Sprinkler Studies, Claude Pair, Boise, Idaho.- "In connection with an economic study of sprinkler irrigation being conducted in Washington, Oregon, and Idaho, information was obtained from seven farmers in Ada County. The cost of irrigating pasture, alfalfa, and clover by sprinklers during the 1950 season was about $25.00 per acre. The average investment in sprinkler equipment was $93.65. Other irrigation costs per acre were: water, $4.60 for about 2-1/2 acre-feet per acre; labor, $8.42; power, $5.40; depreciation of equipment, $6.24; and repair and maintenance, $0.15 per acre.

Surface Irrigation Studies - Sterling Davis, Boise, Idaho.-"Considerable work was done on relating proper size of furrow and border streams with depth of application and length of run. Because of the change of intake rate that occurs with time, runs can be longer if heavy applications of water are made than with shallow applications and efficient irrigation still result. Similarly, with a field of given length, a smaller stream may be used efficiently if heavy applications are made.

Irrigation Water Management and Drainage Practices in the Production of Hay and Forage in the High Mountain Valleys of Colorado - H. K. Rouse, Gunnison, Colorado.-"An analysis of the results of the Feeding Experiment based on the gains during the first 84 days ending on March 21, 1951, indicates the economy of the use of commercial fertilizers and of early cut hay. This experiment is a joint endeavor of local ranchers banded together in the Gunnison County Feeders Research Corporation, the Agronomy and Animal Husbandry Departments of the Colorado Agricultural Experiment Station, the Bureau of Plant Industry and Soil Conservation Service-Research. Six pens, each containing 10 heifer calves loaned by 10 different ranchers, are fed 6 different hays produced or harvested under different conditions. Two more pens are fed hay, produced without fertilizers but harvested at different times, together with a supplement of small amount of cotton seed cake.

"The hay fed was produced on a local ranch with hay meadows at an elevation of about 8,200 feet. The meadow was laid out in strips 100 feet wide and strips were selected at random for fertilizer treatments. These strips extended entirely across the meadow so the effects of variation in soil, topography, and application of irrigation water were eliminated. The hay was harvested and baled in the customary manner and then transported to the feed lot. The fertilizer was supplied by Colorado A & M College and applied by BPISAE technicians. The feeding plant was constructed by the Gunnison County Feeders Research Corporation on land furnished rent-free by Gunnison County. Most of the labor required for construction of the plant was donated by the rancher-stockholders.

"The feeder is employed by Colorado Agricultural Experiment Station and is supervised by the undersigned, who also keeps the records of the experiment. The results are as follows:

(1) Hay produced without commercial fertilizer and cut late, produced This is the usual local practice	149	Pounds gain per acre
(2) Hay produced without commercial fertilizer and cut early, produced	170	" " " "
(3) Hay produced using 75 pounds Nitrogen per acre and cut early, produced	324	" " " "
(4) Hay produced using 180 pounds Phosphoric Acid per acre and cut early, produced	324	" " " "
(5) Hay produced using both Nitrogen and Phosphoric Acid at the above named rates and cut late, produced	258	" " " "

(6) Hay produced using both Nitrogen and Phosphoric Acid at the above named rates and cut early, produced 346 Pounds gain per acre

When a supplement of 1 pound of 41 percent protein cotton seed cake was added to the ration on the basis of 1 pound per animal per day:

(7) Hay produced without commercial fertilizer and cut late, with 240 pounds cake added, produced 243 " " " "

(8) Hay produced without commercial fertilizer and cut early, with 166 pounds cake added, produced 224 " " " "

"When these results are priced out at current local prices and the costs of commercial fertilizer, application of fertilizer, cottonseed cake and labor of feeding are deducted, considering the usual local practice of no fertility treatment and late cutting as 100 percent, gross profits per acre compare as follows:

	Percent
(1) No fertility treatment, late cut	100
(2) No fertility treatment, early cut	122
(3) 75 lb. Nitrogen per acre, early cut	198
(4) 180 lb. Phosphoric Acid per acre, early cut	199
(5) Combined Nitrogen and Phosphoric Acid, late cut	111
(6) Combined Nitrogen and Phosphoric Acid, early cut	188
With a cottonseed cake supplement of 1 lb. per animal per day	
(7) No fertility treatment, late cut	149
(8) No fertility treatment, early cut	147

"These results are based on the results of 84 days feeding, including the coldest weather of a cold winter with minimum temperatures as low as 40 below.

"The experiment will be continued through 120 days feeding after which the animals will be returned to their owners who will turn them out on National Forest or Public Domain Range where they will be bred. About December 1, the animals will be returned to the feed lot, fed a similar ration and remain under observation until they produce their calves."

Consumptive Use and Yield - S. J. Mech, Prosser, Washington.-"The influence of soil moisture on the consumptive use, peak use, and yield, is shown in table 1, figure 1, and figure 2, copies of which can be procured from the project. It is evident from these data that at least for alfalfa, potatoes, sugar beets, and corn, the consumptive use decreases with a decrease in the soil moisture before irrigation.

"Figure 2 shows the peak consumptive uses during the season. It shows that maximum use for different crops may occur at different times of the summer. A crop such as Russet Burbank potatoes planted on June 22 shows a peak use in September, whereas the other crops may peak in July or August. Alfalfa, on the other hand, has a fairly flat peak sustained over a relatively long period of time.

"The difference in yield for alfalfa, potatoes, and sugar beets are not statistically significant between the wet, medium, and dry plots. That for corn is highly significant. Whether the difference between a 128 bushel yield with 8 irrigations and 118 bushels with only 3 irrigations is worth the extra effort will depend on the value placed on this 10 bushels of corn as compared to the cost of getting the additional 8 inches of water into the soil and the cost of the 5 additional irrigations required to maintain this higher soil-moisture condition.

"At first glance these yield data may seem at variance to that reported from other parts of the country where many yields have been doubled by supplemental irrigation. There is, however, a fundamental difference between our test and many of the supplemental irrigation tests and the results do not necessarily have to be the same. In our case, we maintain the root zone soil moisture at different ranges between field capacity and wilting point. In fact, the minimum available soil moisture on our dry plots is 15 percent of that between field capacity and wilting point. Our soil is deep. The root zone for irrigation purposes is about 4 feet in a soil that has no profile development. During each irrigation we add sufficient water to fill the root zone to capacity. We thus revitalize, as it were, the entire 4-foot depth every time we irrigate.

"We do not doubt that permitting the root zone to dry out to wilting point will reduce yield. Conversely, preventing the occurrence of this condition will increase yield over that from a field which reached wilting. There is a possibility also that irrigating with enough water to revitalize only half of the root zone depth may also reduce yield due to a shrinking root zone. If our topsoil or effective root zone were 8 - 12 inches deep, our irrigation schedule would be quite critical. The prospects for drying this shallow root zone to wilting point would be very good indeed. A slight delay could be serious. A little irrigation at the right time could prevent the occurrence of wilting and thus prevent a reduction in yield.

"It seems that results from supplemental irrigation often show the effect of preventing the root zone from reaching wilting point. Our experimentation, on the other hand, deals with the influence of different soil-moisture ranges between field capacity and wilting point. Each is a distinctly different situation.

Irrigation Studies, P. E. Ross, Weslaco, Texas.-"Recovery of citrus groves from the late January freeze is very slow. Indications at present are that more orchards were killed outright by the freeze than was earlier thought. An exceptionally long drought period and scarcity of irrigation water has added to the difficulties of restoration of groves. Light rains during the latter part of the month have been very beneficial from the standpoint of timeliness and have supplied planting moisture, but have not broken the drought period for an appreciable length of time.

"Cotton emergence was good on the irrigation efficiency plots on the Station, but a light frost on March 12 killed enough to hurt the stand in spots. These have been replanted and it appears that this and the original planting will furnish a uniform stand. Three sets of tensiometers have been placed in one of these cotton plots. They have been placed near the soil sampling points and will be used to study consumptive use of the water by the cotton. They are placed at one and two feet depths in the three locations with one extra at 3 feet. The tensiometers are to be calibrated to soil-moisture percentage and moisture use shown by these will be compared with that found by soil sampling.

"Conferences were held March 16 and 17 with Dr. M. L. Nichols, Chief, Soil Conservation Research, and Mr. George Clyde, Chief, Division of Irrigation, Soil Conservation Research. During the first morning, W. R. Cowley, Experiment Station Superin-

tendent, Morris E. Bloodworth, Experiment Station Irrigation and Drainage Engineer, were present. A brief summary of the Lower Rio Grande Valley agriculture was outlined and some of the projects of irrigation research were reviewed. A field trip in the afternoon was made to give a clearer picture of some Irrigation Districts' water-delivery systems including river pumping plants and distribution systems, and farm delivery systems. The outlying project on the H. J. Garrett farm at La Paloma was visited. The experiment on this farm is to determine the irrigation application efficiency of a system designed and installed by SCS Operations. Total water use of the field will also be measured this year by means of a Parshall flume and a water-stage recorder.

"On the morning of the 17th the underground drainage aspects and research projects were discussed briefly. The remainder of the morning was spent in conference with Operations personnel in discussing the correlation of work of research and operations. Albert Hughes, Chairman of the Board of Supervisors of the Willacy-Hidalgo Soil Conservation District, also attended the conference. Operations personnel present were W. T. Moon, District Conservationist, R. E. Daniell, Soil Survey Supervisor, and R. C. Barnes, Irrigation Engineer.

"A field trip in the afternoon was made to some contour benched irrigation systems which the SCS has worked out for the lands of rough topography in the northwest portion of the Valley.

"The 2 days spent with us by Dr. Nichols and Mr. Clyde were most helpful. Dr. Nichols presented an excellent discussion of the broad aspects of the over-all program and the part Washington plays in integrating the entire program. It is felt that the field visits from Chiefs and Division chiefs are essential for an effective and efficient organization.

"One day was spent assisting Operations personnel in the installation of piezometers to study an undetground drainage problem in the western part of the Valley. Some 25 installations were made and techniques in driving, flushing, and reading were demonstrated.

"Permeability runs have been completed on part of the profile of the J. B. Russell farm which assistance is also being given to Operations. The first and second foot of this profile is classed as moderately permeable but the remainder of the profile checked is classed as very slowly permeable. The actual permeability runs were:

0-1 foot	1.85 cc^3/cm^2hr.
1-2 "	1.95 " "
2-3 "	No check
3-4 "	Water failed to come through 12" core in 20 days
4-5 "	0.010 cc^3cm^2/hr.

"The ratio of the core length to the head of water applied to the core on these runs was approximately 1:1.

"A duplicate core was taken and a permeability run was started on a 4-foot length of this core on March 6. A head of 2.5 feet was applied to this section, i. e., from 0 to 4 feet in the profile, and water appeared through the core after 22 days. No measurable amount of water has passed through the core to date. From these data it is obvious that underground tile will not be effective.